<p style="text-align:center; color:red">Department of Electrical Engineering
Area of Research: Signal Processing/Communication/Equivalent</p>

<p style="text-align:center">Criteria adopted for shortlisting PhD applications (Regular, Direct, ERP and Part-Time)</p>

Criteria for Regular category:

1. M.Tech/M.E./M.S. (GEN/OBC/EWS: 70% or 7.5; SC/ST: 65% or 7.0)
2. BTech/BE, 12th class and 10th class (GEN/OBC/EWS: 60% or 6.5; SC/ST: 55% or 6.0)
3. 1st preference for PhD specialization as Signal Processing/Communication or equivalent

In case of B.Tech. degree only:

1. BTech/BE (GEN/OBC/EWS: 75% or 8.0; SC/ST: 70% or 7.5
2. 12th class and 10th class (GEN/OBC/EWS: 60% or 6.5; SC/ST: 55% or 6.0)
3. Valid GATE score for candidate other than IITs
4. 1st for PhD specialization as Signal Processing/Communication or Equivalent

Criteria for Direct PhD category:

1. B.Tech/BE (GEN/OBC/EWS: 75% or 8.0; SC/ST: 70% or 7.5)
2. 12th class and 10th class (GEN/OBC/EWS: 60% or 6.5; SC/ST: 55% or 6.0)
3. Valid GATE score for candidate other than CFTI
4. 1st and 2nd preferences for PhD specialization as Signal Processing/Communication or Equivalent

Criteria for ERP category:

5. Minimum 2 years of work experience
6. All criteria for Regular category

Criteria for PART-TIME category:

1. Minimum 2 years of work experience
2. All criteria for Regular category

Selection: May 2021 Admissions Mode of examination = Online Interview (For syllabus refer ANNEXURE V)

- Date of examination = 10,11,12 May, 2021

ANNEXURE I: Shortlisted candidates for REGULAR PhD Programme

SID	Full name
46961	SHIVA SHARMA
47045	DIVYA MISHRA
47048	APUROOP KUMAR BHATTARAM
47074	Wasiq Mehraj
47075	ABHISHEK BABA
47159	Saily Sengupta
47794	SHIVAM KUMAR SHUKLA
48568	SURAJ KUMAR GUPTA
48661	MOHD SAIF ALI KHAN
48867	SHIVAM SHARMA
49189	SAGNIK BHATTACHARYYA
49194	SHIVANI SAXENA
49795	Shweta Kumari
49929	JYOTISMITA BARMAN
50543	Akshita Sood
50600	AVINASH DUBEY
50705	Maitreya Sengupta
50764	Rameesa Mushtaq
50832	RUCHIKA DHAWAN
50912	NANSE
51085	SHRUTI VERMA
51119	RUPA LALLER
51148	SHALINI THAPAR
51159	K NAGARAJA
51300	SREE RAMA AMRUTHA LAHARI
51396	Shipra Rajput
51509	CHINTALURI YOGANANDA ATREYA
51600	MANSHREE MISHRA
51656	SUBHASREE SAHU
51681	SRISHTI PRIYA CHATURVEDI
51747	MEGHA DIXIT
51772	Ariba Siddiqui
51789	CHAUDHARY MANOJ DEVNATH
51808	Amit Monga
51816	Neha Payal
51875	VISHAL KUMAR
51877	SHUBHAM DWIVEDI
51959	Anushka Srivastava
51981	AMAN VARSHNEY
52072	SAGUN SHARMA
52185	Zahid Bashir Dar
52224	SHOUNAK ROY CHOWDHURY
52234	Ankita Kulshrestha
52421	MANI PRIYA

52465	RAJARSHI MITRA
52610	RITA CHOUDHARY
52625	Prashant Dwivedy
52641	RAHUL BHARDWAJ
52889	ARPIT SHARMA
53030	HIMANSHU GUPTA
53047	BARURI SAI AVINASH
53074	abhishek singhal
53084	ASHUTOSH RAI
53189	PARAMPREET SINGH
53257	PRERNA BHALLA
53311	ADITYA BHARADWAJ
53384	SAURABH TARUN MISHRA
53451	SNEHA SINGHAL
53482	Zubair Shaban
53687	SASWATA DASGUPTA
53696	AMISHI VIJAY
53703	A TEJASWI DORA
53717	PRAGYA SHUKLA
53784	Debanshu Shrivastava
47078	ALLE PRASHANTH
47079	ALLE PRASHANTH
47087	Suraj Kumar
47122	JESMIN ZAKARIA
47194	ANIMESH
47262	ARUN KUMAR R
47963	Mohd Adnan
48572	PRATYUSH VERMA
49571	AMALENDU KUMAR
50332	Richa Verma
50634	PRAVIN TUKARAM MALI
50694	Ritu Tanwar
50925	WAGHUMBARE AJAY ASHOKRAO
51188	Rantu Buragohain
51343	PRANJIT DEKA
51654	RAJU KUMAR SINGH
51732	Chandan Kar
51908	Ankush Koundal
52034	NAHID MALIK
52132	Robin kamboj
52222	NEELU
52252	PATINAVALASA MEGH SAINADH
52365	Sumathy
52638	ADITYA PAL
52871	KAVITA

52991	SHILPA JAISWAL
53025	DIKSHA MAURYA
53068	RAMA GAUTAM
53367	Agathiyan R
53441	VIKAL CHANDRA
53585	Adarsh Singh Niranjan
53705	AYUSHI PAL
51787	MALADI SIVARAMA KRISHNA
53763	VARUN KUMAR
47180	Ravi Kumar
49505	Mane Pooja
51811	SHIKHA SINGH
52457	Shilpa Govindrao Sonone
52912	AADITI BANDUPANT MORE
53409	PRASHANT SHAH
53504	RISHABH KUMAR BAUDH
53543	BABY DIANA
53581	SHALINI VARDHAN
47312	Molkam Rakesh
50102	RAJASHEKHAR
51320	NAVITA KUMARI

ANNEXURE II: Shortlisted candidates for Direct PhD Programme

SID	Full name
47006	ARADHITA SHARMA
48177	Debajit Choudhury
52836	HEMKANT NEHETE
48802	MEGHNA MUKHOPADHYAY
53224	Mohammad Waqas Wani
53364	NAIF NOYEL
53455	PRATHMESH RAJU BHOSALE
53435	SHAZAN AHMAD BHAT
51576	ANURAG RAMRAO LAMBOR
50721	Dhawal Salwan
52644	Piyush Jain

ANNEXURE III: Shortlisted candidates for ERP PhD Programme

No candidate shortlisted.

ANNEXURE IV: Shortlisted candidates for PART TIME PhD Programme

SID	Full name
47119	SHILPA CHAMAN
50404	BHALINDER SINGH

SID	Full name
51885	Nikhil
53791	Ankit Dilip Khivasara

Any applicant who satisfies the above mentioned criteria, but his/her name is not in the list can also appear for online interview on mentioned dates. Provided he/she has already applied within due date.

ANNEXURE V: Syllabus for Online Interview

Engineering Mathematics: Vector space, basis, linear dependence and independence, matrix algebra, eigen values and eigen vectors, rank, solution of linear equations – existence and uniqueness. Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, line, surface and volume integrals, Taylor series. Differential Equations: First order equations (linear and nonlinear), higher order linear differential equations, Cauchy's and Euler's equations, methods of solution using variation of parameters, complementary function and particular integral, partial differential equations, variable separable method, initial and boundary value problems. Vector Analysis: Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stoke's theorems. Complex Analysis: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula; Taylor's and Laurent's series, residue theorem. Numerical Methods: Solution of nonlinear equations, single and multi-step methods for differential equations, convergence criteria. Probability and Statistics: Mean, median, mode and standard deviation; combinatorial probability, probability distribution functions - binomial, Poisson, exponential and normal; Joint and conditional probability; Correlation and regression analysis.
Signals and Systems : Fourier series and Fourier transform representations, sampling theorem and applications; Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay, digital filter design techniques.

a) Signal Processing/Communication or equivalent:
Communications: Autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems; Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers, circuits for analog communications; Information theory: entropy, mutual information and channel capacity theorem; Digital communications: PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; Fundamentals of error correction, Hamming codes; Timing and frequency synchronization, intersymbol interference and its mitigation; Basics of TDMA, FDMA and CDMA.
Electromagnetics: Electrostatics; Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations; Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays; Basics of radar; Light propagation in optical fibers.

b) Image and Video Processing or equivalent:
Digital Signal Processing: Sampling and aliasing. Discrete Fourier transform (DFT) and properties, comparison between circular convolution and linear convolution, linear convolution from circular convolution. Direct evaluation of the DFT, The fast Fourier transform, Decimation-in-time (DIT)

algorithm, Decimation-in-frequency (DIF) algorithm, differences and similarities between DIT and DIF algorithms and inverse DFT (IDFT). Frequency selective filters, design of digital filters from analog filters, design of lowpass, highpass, bandpass and band stop filters, design of IIR filters from analog filters, realization of digital filters. Linear phase FIR filters, frequency response of linear phase FIR filters and location of zeros, Design of FIR filters using windows, realization of FIR filters.

Digital Image Analysis: Digital image fundamentals; Image Enhancement in Spatial Domain; Gray Level Transformation, Histogram Processing, Spatial Filters; image Transforms; Fourier Transform and their properties, Fast Fourier Transform; Image Enhancement in Frequency Domain; Colour Image Processing; Image warping and restoration; Image Compression; Image Segmentation; edge detection, Hough transform, region based segmentation; Morphological operators; Representation and Description; Features based matching and Bayes classification; Introduction to some computer vision techniques; Imaging geometry.